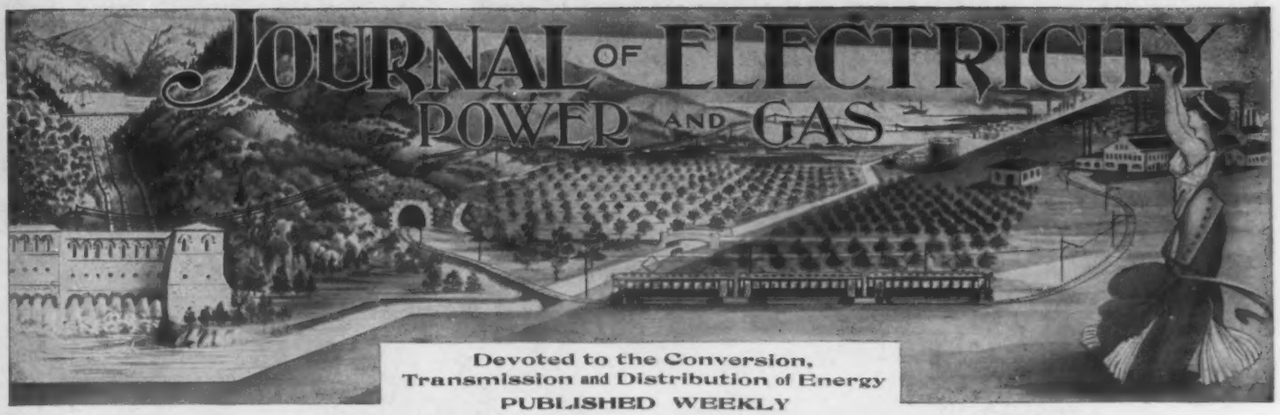

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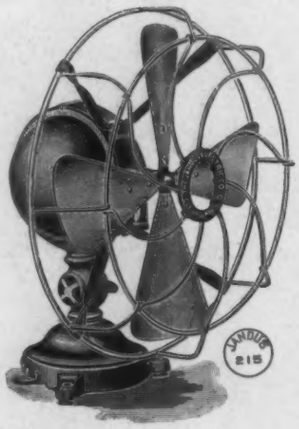

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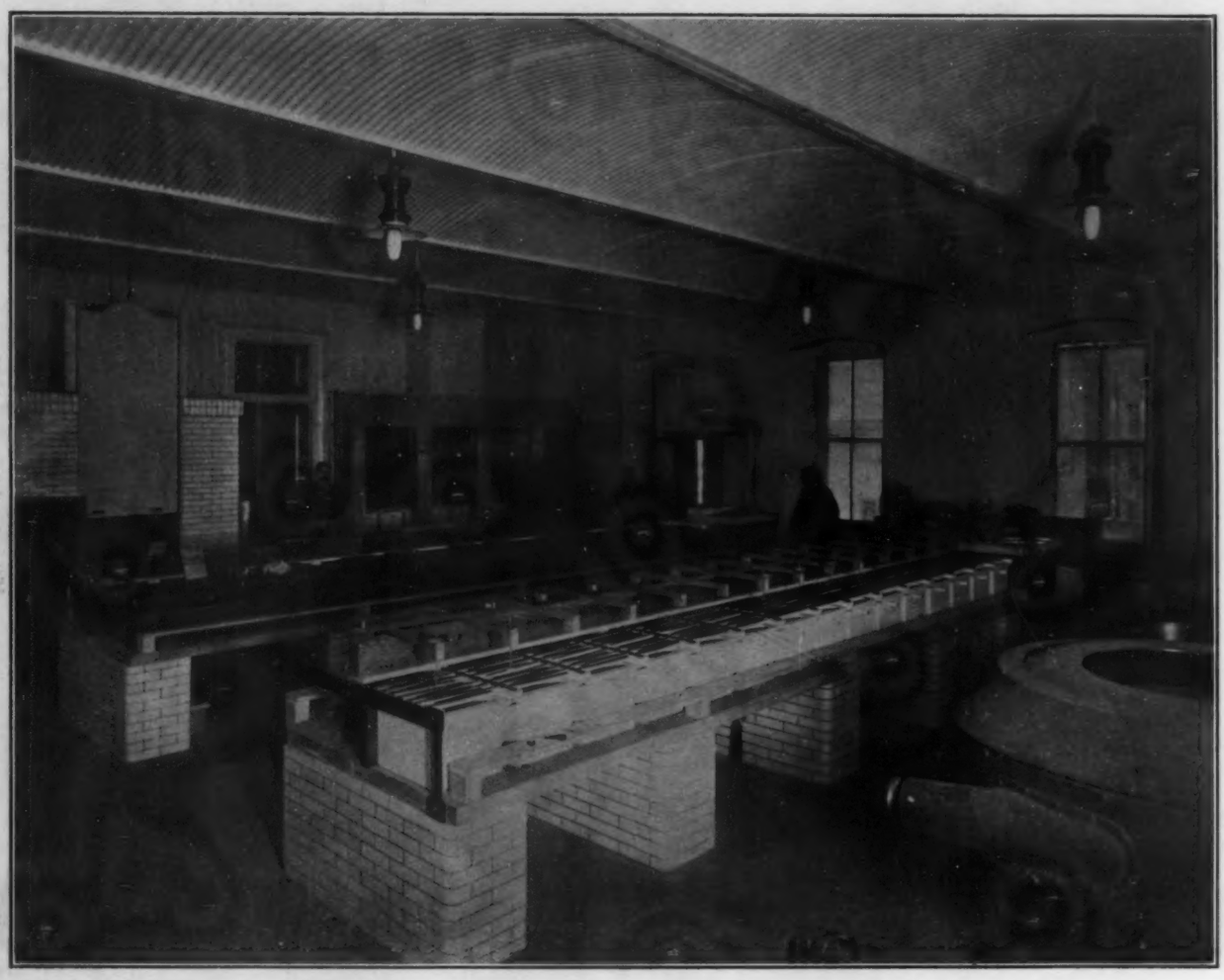
VOLUME XX. SAN FRANCISCO, CAL., MARCH 14, 1908 No. 11

ELECTROLYTIC REFINERY AT THE SAN FRANCISCO MINT.

By ARTHUR H. HALLORAN.

All gold and silver coined at the San Francisco Mint is now being refined electrolytically. This refinery was placed in partial operation on March 5th, 1908, and to date has been operated satisfactorily. It is the third electrolytic refinery that has been installed in the Mint service, the process having been first developed at the Philadelphia Mint,



CELL ROOM IN ELECTROLYTIC REFINERY AT SAN FRANCISCO MINT.

subsequently put in at Denver, and finally installed at the San Francisco plant, being modified as suggested from experience at the firt two plants, under the direction of Mr. Robt. L. Whitehead.

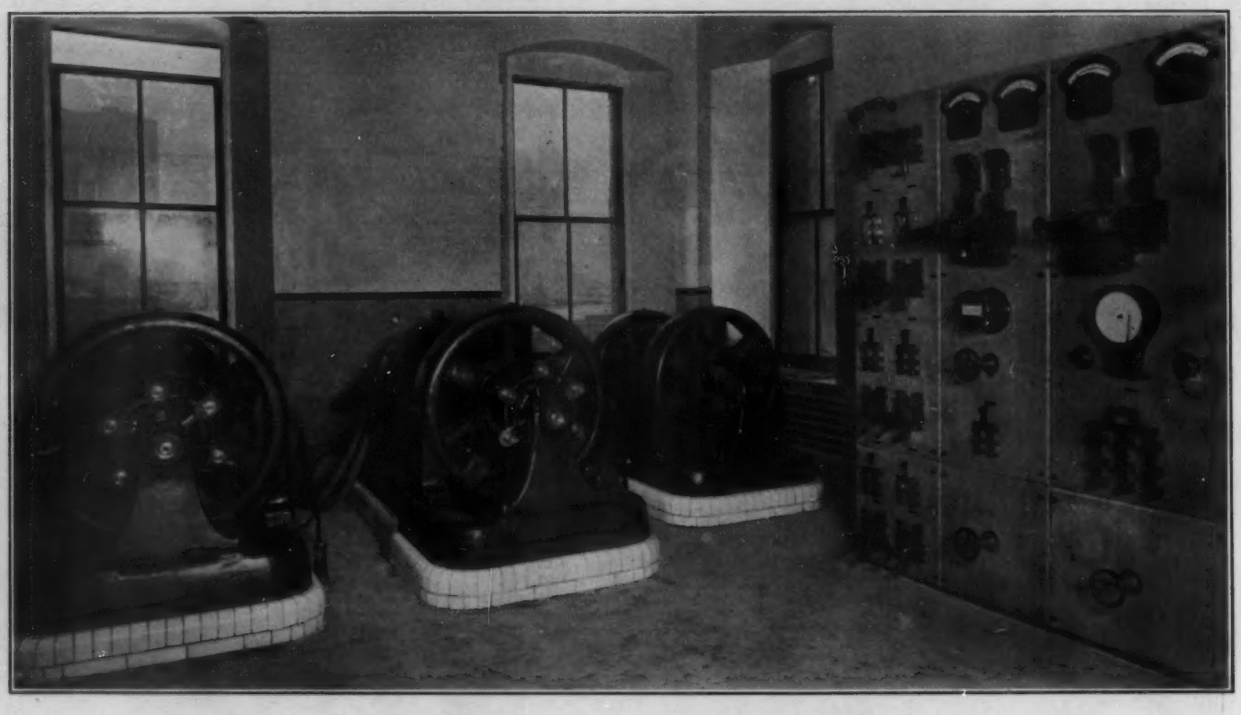
Two methods are in use: the Wohlwill, for gold, and a modification of the Balbach process for the silver. The former involves several changes in the process of Dr. E. Wohlwill, who was the first to successfully refine gold electrolytically, having advanced the principle that it is impossible to affect the electro-chemical solution of gold, in an electrolyte of neutral gold chloride. The anode consists of alloy gold, having a fineness of about 850 as received from the deposit melting room. The electrolyte is a solution of tri-chloride of gold, with an excess of free hydrochloric acid. The cathodes are very thin strips of pure gold, 999.9 fine. The electric current carries the gold from the anode through the electrolyte and deposits it on the cathode, these being about one-half inch apart and suspended vertically.

In the silver refining there is a graphite cathode and a dore anode, both being suspended horizontally in a basket containing the electrolyte, a solution of silver nitrate with excess of nitric acid.

Having briefly outlined the two processes employed, we are at liberty to take up a detailed examination of the plant. It consists essenetially of four parts—generating,

refining, melting, and an experimental laboratory. These are all on the second floor of the building, and will be described in the order mentioned.

Generator Room—As shown in the accompanying photograph, this room contains the three motor-generator sets, supply current at 15 volts, and the other is a 250-volt board, and also a small set for copper deposition. Direct current at 250 volts is obtained from the mains of the San Francisco Gas & Electric Company. This is reduced in voltage and raised in amperage by means of three motor-generator sets. Two temporary ones consist of a 30-horsepower, G. E., 6-pole, continuous-current motor, 105 amperes, 250 volts, direct connected to a 1,000-ampere Eddy dynamo supply current at 15 volts, and the other is a 250-volt 88-ampere, G. E., 6-pole motor, and 25-volt, 500-ampere, G. E. generator. Each set can be operated independently



MOTOR GENERATOR SETS AND SWITCHBOARD.

on either gold or silver cells, or both sets can be used to supply either one. The Engineering Specialities Co. will install a 200-ampere, 6-volt set for copper work, similar to one now in the experimental laboratory, this last being so designed as to deliver its full current output at any voltage up to the maximum. Block brushes containing a high percentage of copper with sufficient graphite to give perfect action and high durability are used, being attached so that while it is fed with uniform tension the position on the commutator is not changed as it wears. This prevents irregular action and undue wear, and insures sparkless operation and cool running, even under heavy loads, 170 amperes to the square inch having been carried in the test run. The sets are mounted on foundations of glazed brick, the floor in this and all other rooms consisting of slabs of Albarene soapstone.

The main switchboard in the dynamo room consists of six panels, three being motor and three generator, two for each of the three motor-generator sets. With it is an auxiliary switchboard from which are controlled the centrifugal pumps, the elevator and the apparatus in the rolling room. The panels are of Alberene stone two inches thick, hone-finished on both sides. The picture shows the auxiliary and two of the main panels, the other four continuing to the right. The auxiliary panel is 24 inches wide, as are also the three motor panels. The generator panels are 30 inches wide, giving a total length of 15 feet 6 inches. The panels are eight feet high, six feet being in the main board and two feet in the base. The equipment of the motor panel for the 25-volt set consists of one 100-ampere Weston ammeter and one 300-volt Weston voltmeter, one 100-ampere, double-pole, overload, no-voltage release, time-limit, I. T. E., type L. L., Cutter circuit breaker, one 100-ampere Sangamo recording wattmeter, one Cutler-Hammer motor field rheostat, one 100-ampere double-pole, double-break knife switch, and one G. E. starting rheostat, S. A. type. The generator switchboard of the same set consists of one 750-ampere Weston ammeter, one 35-volt Weston voltmeter, one 600-ampere circuit-breaker, one 800-ampere Bristol recording ammeter, two red bulls eyes, one 600-ampere, double-break, triple-pole switch and one G. E. generator field rheostat.

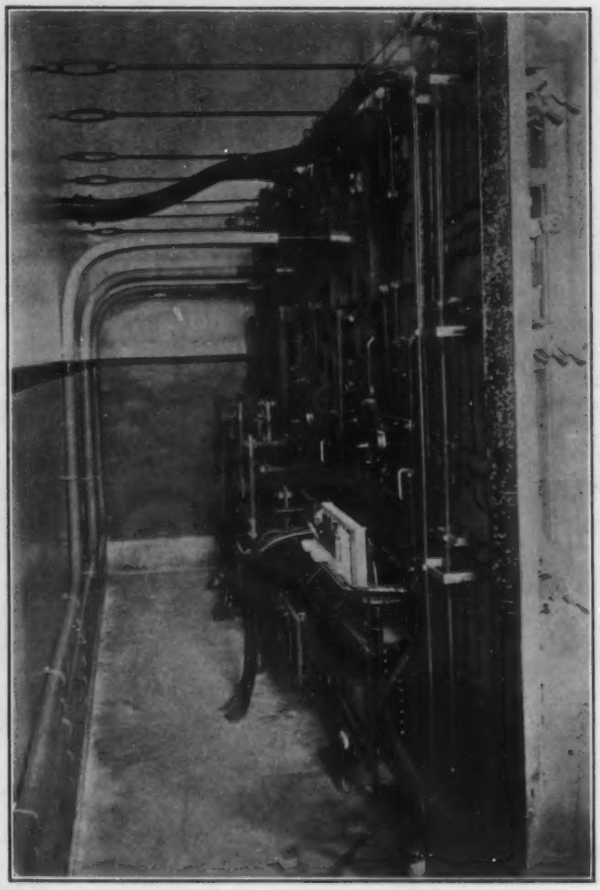
The other two sets are each controlled from similar panels with slightly different equipment. The motor panel has a 200-ampere Weston station ammeter and a 300-ampere Weston voltmeter. The same type of circuit-breaker is used, it having a capacity of 200 amperes; also a 200-ampere Sangamo wattmeter. One Cutler-Hammer motor field rheostat, one 200-ampere, double-pole, double-break knife switch and one G. E. motor starter, S. F. type, completes this panel equipment. The corresponding generator panel has a 1,500-ampere Weston ammeter and a 25-volt Weston voltmeter, a circuit breaker with a capacity of 1,250 amperes, a 1,600-ampere Bristol recording meter and a switch for 1,200 amperes, being arranged for double throw to either silver or gold cells. A G. E. generator field rheostat completes the front equipment.

The auxiliary switchboard is equipped with a circuit-breaker and switch for each of the circuits that it supplies. These include a 5-H. P., G. E., C. Q. motor, running the centrifugal pump, an Otis elevator having a speed of fifty feet per minute, a 15-H. P. type-S. variable-speed, Westinghouse motor, operating the water-cooled rolls, a 5-H. P., G. E., C. Q. motor operating a 200-ton hydraulic press, a

cutting machine, and a 10-H. P. motor running a Sturtevant blower supplying the air for the melting furnace.

The panels are supplied by separate circuits from the main board in the basement through an old flue running to the attic, from which lead-covered, Grimshaw, rubber-insulated cables are run in Bossert electro-duct conduit to the switchboard. The wires from the board to the motors are run through two 2-inch and one 1½-inch conduits placed underneath the floor. Of the stranded lead-covered wire, 00 supplies the 30-H. P. motors, 0 the 25-H. P., and 0000 the auxiliary board.

The feed from the 1,000-ampere generators to the board consists of four 2,000-circular-mils, paper-insulated, lead-covered cables, and for the 500-ampere set consists of two 1,000-circular-mils cables. These are run through iron



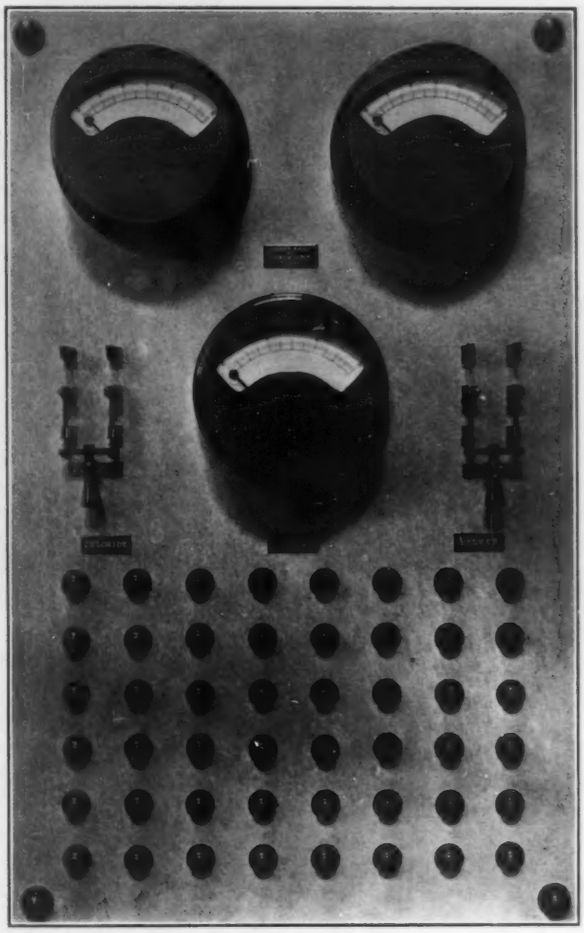
BACK OF MAIN SWITCHBOARD.

pipes set flush against the wall and strapped to it so as to give a rigid support, going first to the circuit-breaker. All the lugs on the back of the board have been specially designed.

The current from the board to the gold and silver tanks is carried by four 1,000-circular-mils, paper-insulated, lead-covered cables which terminate in specially-designed lugs. These lugs are enclosed in Alberene stone boxes, six inches each way, which have been filled with beeswax and rosin to protect the copper from acid. From thence the wires run to the copper strips to which the cells are connected. The 30 gold cells are connected in series, and the 12 silver cells in series parallel.

The main busbars have a capacity of 1,250 amperes, being composed of three 4x⅛-inch copper bars, laminated, This switchboard was built and installed by the Walker Electric Co., but all the wiring and work in connection with it, as well as the other wiring throughout the plant, was done by Mr. John J. Marshall, Chief Electrician of the San Francisco Mint, to whom credit is due on account of the neat and workmanlike manner in which the job was finished. There is a space of four feet at the back of the board and all incoming and outgoing wires have been carried so that there is no obstruction to walking, and all connections have been made so as facilitate testing and reduce breakdowns to a minimum. The accompanying photographs illustrate the excellence of this work better than do the writer's words.

A smaller board is to be built in the cell room, by means of which the cell man will know the current consumption without having to go into the dynamo room. This



LABORATORY BOARD SHOWING CONDITIONS IN REFINERY.

board will be equipped with two 1,500-ampere and one 750-ampere ammeters, and two 25-volt and one 35-volt voltmeters. All these instruments are being supplied by the American Instrument Co., and are also mounted on Albarene stone.

The working of this entire system is made known in the office of laboratory by means of a board specially designed in the San Francisco Mint. As shown in the accompanying photograph, by pressing one of the forty-eight buttons on the board the ammeter and voltmeter will record the conditions in the cell desired. These buttons are numbered from 1. to 6. for the chloride cells, from 1. to 30. for the gold cells, and from 1. to 12. for the silver cells. The voltmeter from the chloride and silver cells registers from 0 to 6. and that for the gold cells from 0 to 3. The double-throw knife-switches can be changed to either of the two large meters, connected so as to show the voltage between any two tanks. Busbars are stiips of 3⅛-inch x No.

21 hoop brass. No. 18 rubber-covered Grimshaw wires in iron conduits are run from this board through the bottom of the cell tables to each tank.

The cell room is lighted by means of four 250-volt G. E. enclosed arcs, the rolling room by two, and the melting and generator rooms by one each. All offices and laboratories are lighted by incandescent lamps in Hubbell separable pull clusters.

Gold Refining—Formerly all the gold from the deposit room was alloyed with silver in the proportion of one part of gold to two and one-half parts of silver, there being present from one to two per cent base. Treatment with hot concentrated sulphuric acid dissolved all but the gold which was remelted, to give a fineness of about 995. Silver was precipitated by copper from the sulphuric acid solution and pressed into cakes for convenient melting. The copper was recovered as blue-stone by evaporating the solution.

For ten years electrolytic processes were developed at the Philadelphia Mint, beginning as small laboratory experiments and developing into a plant having a weekly capacity of 90,000 ounces of gold and 375,000 ounces of silver. It has been found cheaper, neater and cleaner than the process just described. The practical work at this plant and at the Denver Mint has shown certain modifications to be desirable. Precipitation is carried on in Royal Berlin porcelain tanks each 13½x18 inches in cross-section and 12 inches deep, this ware being unaffected by chemical action. These cells are arranged in two rows of 15 each, supplied with electrolyte by a central trough with side-supply discharging into a trough on either side. In the final installation the solution will be continuously circulated by a porcelain plunger pump, but temporarily the cells are filled by hand and agitation in each cell is caused by glass propellers belt-connected to a G. E. motor. These cells rest directly on great slabs of Alberene soapstone, which are supported on glazed brick pillars. In each cell are suspended six anodes and six cathodes.

The anodes consist of slabs of deposit gold, each eight inches long and three and one-half inches wide and about one-half inch thick, tapering at one end. They are cast with holes for suspension from porcelain rods. These porcelain suspenders are used both for anodes and cathodes, and are covered with strips of pure gold, to conduct the current. The anodes are blended from gold as low as 800, with gold of 990 or over, so as to give a fineness of 940 or 950, the balance being silver and base. More than five per cent of silver interferes with the working, as it is the only part of the anode not dissolved in the electrolyte, being precipitated onto the anode as a chloride. This adheres tightly to the anode if in excess, instead of dropping to the bottom of the cell as it should. If it sticks to the anode the voltage may be increased fully twenty-six per cent, the anode area is reduced and gaseous chloride is evolved and the proportion of the gold in the solution is lessened. The base consists of copper, lead, zinc, bismuth, tellurium, platinum, etc. This is dissolved in the electrolyte, but fouls it after a time, being removed as described later.

The electrolyte consists of an acid solution of gold tri-chloride containing from fifty to sixty grams of metallic gold to the liter and from five to ten per cent of free hydrochloric acid. Ordinarily chloride of gold is prepared by dissolving the metal in nitro-hydrochloric acid (aqua regia), and driving off the nitric acid by heat. But by aid of the electric current nascent chlorine dissociated from the hydrochloric acid unites with the gold to form the chloride. This eliminates nitric acid in this process.

The cathodes are strips of 999.9 fine gold rolled to a thickness of 1-100 of an inch, being ten inches long and three and one-half inches wide. After enough gold has been deposited on them they are carefully placed in specially-designed porcelain filters which are mounted on trucks and run close to the cells whence the cathode is lifted by the cell man. When the filters have been filled they are carried by an elevator to the filtering platform and washed with hot water for half an hour, the loaded filters are then run into steam drying ovens, and when dry are returned to the melting room. Thus the gold is not handled after leaving the cell man until it reaches the melter.

The filtrate and wash water are run into large earthenware tanks, where any gold present is thrown out of the solution with ferrous sulphate. The remaining solution runs by gravity into iron tanks below, being filtered on its way down, where any copper, platinum, etc., present are precipitated as cement copper, being replaced by iron. Steam coils are used to heat the solution and hasten the reaction. It is then pumped into a storage tank above and evaporated by means of lead steam-coils until sufficiently concentrated to be used to precipitate the gold from the foul solution as before described, the iron being in a ferrous state.

The cement copper is melted into anodes and subjected to electrolysis, the copper being deposited on the cathodes and the other metals forming a slime that is treated only for the platinum, palladium, gold and silver it may contain.

The plant has been in operation such a short time that no details of operation are yet available. The slimes constitute from five to ten per cent of the output of the cathodes, consisting of from ninety to ninety-five per cent gold. Two electric-driven centrifugal driers, made in Germany, facilitate rapid handling of all filtrates and other products. A current density of 60 amperes per square foot of cathode surface has dissolved similar anodes in thirty-six hours. The process works to commercial advantage at 100 amperes or over, fouling the solution somewhat more rapidly and requiring more frequent additions of gold chloride. In a report of the Denver plant, as written by Mr. Robt. L. Whitehead, in the Report of the Director of the Mint for 1906, he states: "The higher the current density maintained, the purer will be the deposit, provided a uniform temperature be maintained and there be sufficient gold in the solution to prevent a spongy deposit, which means there should be over thirty grams to the liter. The absence of sufficient free acid is always shown by 'gassing' at the anodes."

Silver Refining—The silver electrolyte consists of two per cent silver nitrate solution acidified with from two to three per cent of hydrochloric acid, and is pumped by means of earthenware centrifugal pumps driven by 4-H. P. G. E. motors, into a large Bertuch earthenware jar, from which it is distributed by a central trough to the silver cells. Side discharge into a return trough gives the solution continuous circulation. These cells are twelve large Bertuch earthenware tanks, each 47 inches long, 26 inches wide and 12 inches deep, arranged in two rows of 12 each. Suspended in each tank are two earthenware perforated baskets. A cloth filter is put in to collect any residual gold sludge, and on it is laid horizontally the

graphite cathode. Six inches above these is suspended horizontally a dore cathode, consisting of from 970 to 980 parts of silver and from twenty to thirty parts of gold. The foundations of these tanks are likewise glazed brick on which are placed three-inch slabs of Albarene soapstone. The same system in handling the product of these silver cells is used as in the gold cells, with the exception that the silver is recovered in a powdery form on the cathodes, being periodically removed from them by rubber shovels. This is pressed into cakes and remelted, as in the old process. In time the solution becomes fouled with copper and lead. By adding sulphuric acid the lead is precipitated as lead sulphate, and the copper is replaced by iron. This copper is cast into anodes and from it is recovered any remaining gold and silver. The Waterbury Farrel Foundry & Machine Co. is installing, in a room next the melting room, a rolling mill for rolling the gold cathodes, and a 200-ton hydraulic press for compressing the silver and the copper residues.

MELTING ROOM.

Melting Room.—The melting room in connection with the refinery (as shown in the accompanying picture), is equipped with four large oil-burning crucible furnaces. An oil-burning reverberatory furnace, part of which is shown on the extreme left, in the foreground of the picture, and an oil-burning cupel furnace, complete this department. The furnaces are made of steel plate and angle iron bolted together. They are lined with 9-inch fire brick, which will have to be replaced every two or three months. The crucible furnaces give a heat of 2,600 degrees or over, and melt from five to six thousand ounces at a time. The idea is to give a quick heat to reduce the volatilization loss. An electric-driven Sturtevant blower supplies the air blast. From a reservoir outside of the building oil is pumped by duplex steam pumps in the attic above the refinery.

Exhaust steam is used to heat the oil, so that it is delivered to the burners at about seventy degrees F. This preliminary heating aids combustion and reduces the amount of deposited carbon in the chamber. All of this equipment was put in by the Rockwell Engineering Co., of New York City.

Experimental Laboratory—Not the least interesting part of this installation is the laboratory. In addition to the usual apparatus and reagents necessary for the ordinary run of work, it is supplied with electric hot plates, annealing ovens, evaporating baths and furnaces, for experimental work. It has a small motor-generator set and a special switchboard for electrolytic determinations, and, in addition has a portable ammeter, voltmeter and ohmmeter, this latter being supplied by the Whitney Instrument Co. The platinum was supplied by J. Bishop & Co., is ample for all requirements. Table tops, reagent racks, weighing and mixing shelves, sinks and floors, are all of acid-proof Albarene soapstone. All the acid-boiling hoods throughout are made of this stone.

Pending an illustrated account of the electric apparatus furnished by Justinian Caire Company of San Francisco through Eimer & Amend of New York City a list of it will indicate how completely the laboratory is equipped for delicate work. It includes two Prometheus electric heating plates 12x18 inches using up to 1500 watts and arranged for three separate heats; a Simplex drying oven 12x14 inches inside with connections for three peats, a Kryptol crucible furnace for crucibles 10x9 cm. and a Kryptol bath 20x30 cm. This Kryptol is a black granulated resistance material which becomes hot when subjected to an electric current. It is said to produce any temperature up to 25,000 by varying the thickness and the current. Direct current at 220 volts is used in all this work. In addition there is ample provision for electrolytic work.

LABORATORY.

In conclusion, it may be said that the electrolytic methods which have displaced the old methods of refining, are much superior. It is found that the gold supplied the coiner is more easily worked, and contains no platinum to destroy the dies. It is also cheaper and quicker, this last being an important item in reducing the large interest charges that are ordinarily locked up with so much idle metal, although this matter is not so important to the Government as it would be to a private concern, as it pays no interest on its gold.

Ten mercury arc rectifiers are used to transform single-phase, constant-potential alternating current into constant direct current for the operation of 750 four-ampere continuous-current series arc lamps by the Portland General Electric Company. The ninety per cent efficiency claimed at full load is better than the eighty per cent obtained with a motor-generator set. The lamps require eighty volts each, with a starting voltage of ninety.

Patent for a process for producing poreless and well-adhering electrodeposits has been granted to Harry Schmidt, Schmidt, Cologne Germany. It consists in first providing the metal to be electroplated with a coating of a metal or alloy which melts at a lower temperature than the final electrodeposit, in then electrolytically depositing the final coating, and in melting the intermediate coating.

CENTERVILLE TURBINE INSTALLATION.

By Jas. H. Wise.

Concerning the Centerville Turbine Installation and Mr. Homberger's discussion of the original paper, the writer wishes to amplify some of the statements made therein. In this particular installation a constant quantity of water is flowing in the Centerville Canal, and as there is no chance for storage, either at the upper end, or lower end of the canal, it is necessary in order to get full use out of the water, to keep the Centerville unit on the line at full load for twenty-four hours out of the day. If the water is not used for generating power, it is either by-passed, or is spilled into a natural water course and its useful energy is lost. The average efficiency of the installation is therefore high, and the considerable waste of water referred to by Mr. Homberger, due to regulation, does not enter into the discussion. The turbine has lately been operating with a load factor of about ninety per cent, and has practically been on the line continuously. The pressure regulator was designed for speed regulation as well as for relieving the pipe line and wheel casing of excessive pressure, due to water hammer. It is not a device for economizing water.

The precautions to guard against the wear of the guide and runner vanes are no more than have been taken in the case of impulse installations on various parts of the system, and in fact, more effective means are generally used, in as much as large forebays, or reservoirs of several million cubic feet capacity are used for regulation, and this effects the settling of all silt and detritus, giving very clean water for the wheels. This arrangement was impossible for the Centerville installation, due to the steep side hill slopes at the termination of the canal.

Mr. Homberger treats very lightly the subject of a two or three hundred pound bucket leaving the disc during operation; the writer knows of two instances where the sudden breaking of a bucket caused the complete destruction of the entire wheel.

The writer will say that he feels he is familiar with the progress that has been made on vertical shaft, multiple jet, impulse wheels, and is also acquainted with the fact that the same firm of prominent Eastern engineers who installed the plant in Mexico with vertical shaft, two jet, impulse wheels, is at the present time supervising a very large installation in California where Francis turbines are to be used exclusively. The installations are, however, not to be compared, for the impulse wheels above mentioned are under a head of about 1300 feet, while the turbine installation will have an ultimate head in the neighborhood of 500 feet.

The fact that the Pelton Water Wheel Company, the chief Western competitor of the Doble Water Wheel Company, with which Mr. Homberger is associated, has also undertaken Francis turbine design and construction for medium heads and high speed, would seem to be an acknowledgment on the part of the wheel builders that there is a special field for each type of wheel.

The wireless telegraph station at Mare Island, California, on March 8th received a message from Admiral Evans, 1,300 miles south of Magdalena Bay, a total distance of 2,600 miles. The message was repeated from the St. Louis at Magdalena Bay, and told of a marine's death and burial at sea.

PREVENTION OF WOOD DECAY.

It is estimated that a fence post, which under ordinary circumstances will last for perhaps two years, will, if given preservative treatment costing about 10 cents, last eighteen years. The service of other timbers, such as railroad ties, telephone poles, and mine props, can be doubled and often trebled by inexpensive preservative treatment. To-day, when the cost of wood is a big item to every farmer, every stockman, every railroad manager—to everyone, in fact, who must use timber where it is likely to decay—this is a fact which should be carefully considered.

It is easy to see that if the length of time timbers can be used is doubled, only half as much timber will be required as before and only one-half as much money will need to be spent in the purchase of timber. Moreover, many woods which were for a long time considered almost worthless can be treated and made to last as long as the scarcer and more expensive kinds.

Of the actual saving in dollars and cents through preservative treatment, a fence post such as was mentioned at the beginning might serve as one example. The post is of loblolly pine, and costs, untreated, about 8 cents, or, including the cost of setting, 14 cents. It lasts about two years. Compounding interest at 5 per cent, the annual charge of such a post is 7.53 cents; that is, it costs 7.53 cents a year to keep the post in service. Preservative treatment costing 10 cents will increase its length of life to about eighteen years. In this case the total cost of the post, set, is 24 cents, which compounded at 5 per cent, gives an annual charge of 2.04 cents. Thus the saving due to treatment is 5.49 cents a year. Assuming that there are 200 posts per mile, there is a saving each year for every mile of fence of a sum equivalent to the interest on $219.60.

In the same way preservative treatment will increase the length of life of a loblolly pine railroad tie from five years to twelve years and will reduce the annual charge from 11.52 cents to 9.48 cents, which amounts to a saving of $58.75 per mile.

It is estimated that 150,000 acres are required each year to grow timber for the anthracite coal mines alone. The average life of an untreated mine prop is not more than three years. By proper preservative treatment it can be prolonged by many times this figure. Telephone and telegraph poles, which in ten or twelve years, or even less, decay so badly at the ground line that they have to be removed, can, by a simple treatment of their butts, be made to last twenty or twenty-five years. Sap shingles, which are almost valueless in their natural state, can easily be treated and made to outlast even painted shingles of the most decay-resistant woods. Thousands of dollars are lost every year by the so-called "bluing" of freshly sawed sapwood lumber. This can be prevented by proper treatment, and at a cost so small as to put it within the reach of the smallest operator.

In the South the cheap and abundant loblolly pine, one of the easiest of all woods to treat, can by proper preparation be made to take the place of the high-grade longleaf pine for many purposes. Black and tupelo gums and other little-used woods have a new and increasing importance because of the possibility of preserving them from decay at small cost. In the Northeastern and Lake States are tamarack, hemlock, beech, birch, and maple, and the red and black oaks, all of which by proper treatment may help to replace the fast-diminishing white oak and cedar. In the States of the Mississippi Valley the pressing fence-post problem may be greatly relieved by treating such species as cottonwood, willow, and hackberry.

Circular 139 of the Forest Service, "A Primer of Wood Preservation," tells in simple terms what decay is and how it can be retarded, describes briefly certain preservatives and processes, gives examples of the saving in dollars and cents, and tells what wood preservation can do in the future. The circular can be had free upon application to the Forester, Forest Service, Washington, D. C.

WARES OF A WASTED RACE.

By Clem. A. Copeland.

THE Diversion Division of the Department of Archeological Engineering of the "Journal" listened to a story of Western life—a story of long ago. And through the blue haze of a panatella, while the Pullman smoker was speeding away a thousand miles in a day, the story was told of how the Apaches and the Navajos, perhaps a hundred generations ago, gazing over the distant mountains saw visions of a new and warmer clime. From the bleak plains of Canada they journeyed a thousand miles, but alas, not in a single day, for months of patient, dogged travel were passed in reaching the weird, sear plains of the arid zone, where the Colorado and the Rio Grande lay steaming in the sun.

So the warlike Navajos, the Pimas and the Apaches drove the other tribes away, as the story goes, these leaving graves in their front yards filled with vases, the implements of their craft and the bones of an ancient civilization. Were those who fled before the invaders the Aztecs or a more ancient race? We show in a photo below, the face of one of these aborigines; but, alas, he is silent and will not answer.

Thus, out on the sage brush wastes of New Mexico, to the north of the Santa Fe, lie the foundations of stone and sun-baked mud, this old race, scarcely discernible, except to the practiced eye of the Navajo guide, who knows where to dig for the bones and handiwork of these ancients, of whom there are even no traditions in the lore of the tribes now there. Here is a vase made by spirally winding strips of mud pressed to adherence with the thumb nail and even the imprint of the skin of the thumb, baked into their flinty substance.

We show in these pages a rare collection made by Mr. Orcutt, Geological Engineer for the Union Oil Company, from quite widely-separated points in this section. The swallow-nest vases just talked of are easily picked out from the others, which show a marked similarity of figuring, with the exception of the ollas, or cooking vessels, which are quite like those of nowadays. To the "swallow nests" or "thumb nail" pottery is ascribed the greatest antiquity. The almost Grecian designs and the artistic shapes, rather "nouvoux" in style, together with an excellent mechanical workmanship, merit a lingering interest. One is forced to admit that the art and workmanship is superior to that of latter-day arrivals.

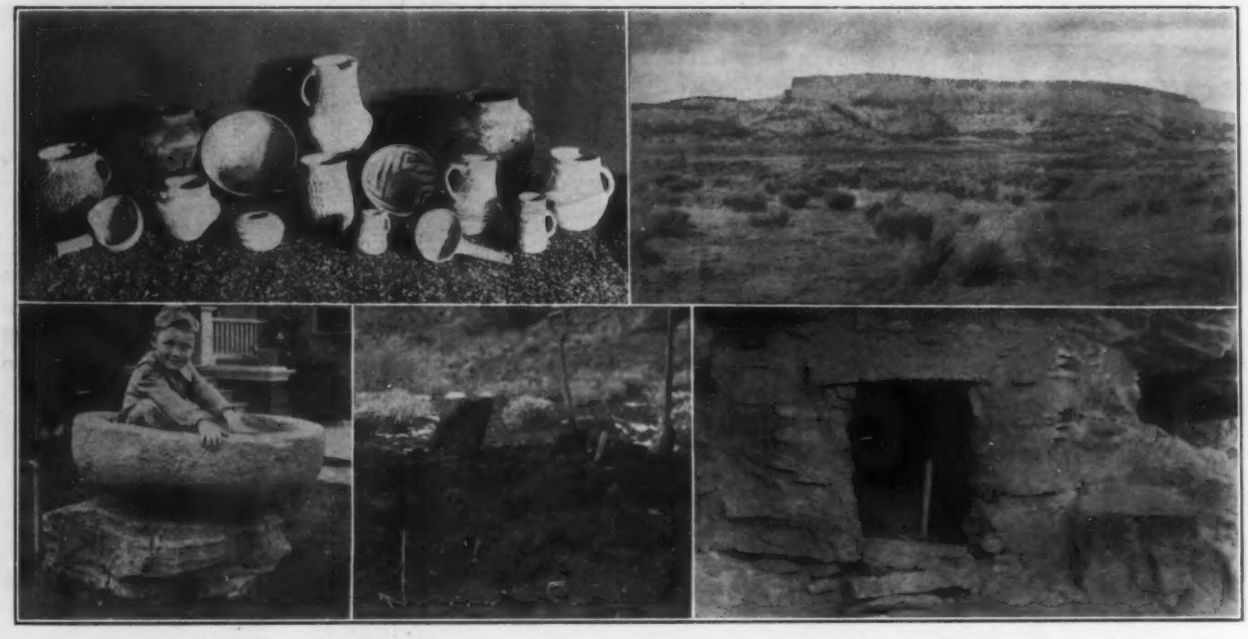
The vast area from Colorado to Central Mexico contains similar wares of a plentiful population, evidently not the predecessors of the tribes now inhabiting the great Southwest. With the ruins left behind no implements of war are found; indicative of a peaceful people of a single tribe; for division would mean tribal wars.

In the neighborhood of the dim ruins are dried-up basins once filled with water, the stone steps still standing, stranded in the glaring sun, which led the way down to the water's edge; and there are abandoned irrigating systems, too, telling of a progressive race, and a once fertile land.

Near by is a cliffed mesa, "Battle Mesa," as it is called, its perpendicular cliffs serving as a barrier to the foe save at one end where stone steps lead to the top. Here perchance the Apaches and Navajos laid siege and entrapped the peaceful people.

Many believe that the Cave Dwellers were these selfsame people, driven to "cyclone cellars" of safety by the invaders. It is also believed by some that the Hopi Indians—the interesting builders of the first seven-story skyscrapers in pueblo-land—are the descendants of those who fashioned these wares—the hinted race from where? The present Pueblo Indians, or the Hopis, it seems, have settled in, and to a certain extent remodeled the old villages which Coronado found silent and deserted three hundred and seventy years ago.

Mr. Orcutt has, also, in his collection of Indian craft, a mortar found buried in the Santa Inez Valley of California, which has some 600 pounds to its credit, and must have ground meal for quite a tribe, while the Mission bells called them to Purissima service. From its esconded rest it has been brought to the busy city, and a modern sun beams in the bowl.



WARES OF A WASTED RACE. PURISSIMA MEMENTO. SILENT MAN FROM NOWHERE. BATTLE MESA IN THE WASTES OF NEW MEXICO. A CAVE OF THE CLIFF-DWELLERS.

THE JOURNAL OF ELECTRICITY POWER AND GAS

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VOL. XX MARCH 14, 1908 No. 11

EDITORIAL.

APPLICATION OF ELECTRICITY TO METALLURGY.

The application of electricity to the refining of gold and silver bullion, as described in this issue, is but one utilization of the many results of long, painstaking efforts on the part of indomitable workers in the chemical laboratory. Such a process is not like a bumble-bee, biggest when born, but resembles the growth of a man from infancy to maturity. It is a matter of slow development. By its novelty, and because of its great potentialities, electro-chemistry has attracted many investigators, whose work is just now being applied practically. The various industries that have grown from the nucleal manufacture of aluminum at Niagara Falls, Canadian and Californian experiments in electric iron smelting, and the large electrolytic copper refineries, are examples familiar to American readers. French, German and Italian researches have extended even further, and will shortly have practical exemplification in this country.

To list these applications would be to catalogue the mineral products of economic importance, for there is no substance that cannot be either decomposed, melted or volatilized by electricity. Its energy is available for either chemical, mechanical or heating action, giving perfectly controlled gradation from the feeblest efforts to the most intense manifestations of each type. This makes an ideal reagent for analysis and synthesis requiring delicacy of chemical manipulation, and accuracy of elemental proportion, combined with great heat not easily obtained otherwise. All electro-chemical operations are performed either by the analytical properties of an electric current passing through an electrolyte or by the heat produced when a current of electricity passes through a conductor which is not an electrolyte.

In the laboratory the main objection to the use of electrolytic analysis has been the long time required to complete the reaction, whereas the same separation can be accomplished in less time by ordinary chemical means. Recent investigations have partially removed this difficulty by employing mercury cathodes. Yet the advantages of cleanliness, accuracy and simplicity, especially where no other chemicals are to be added, counterbalance this objection, so that electro-chemical analysis is fast finding favor with chemists.

But, due to the requirements of a materialistic world, demanding dividends on dollars invested, the industrial application is getting far more attention. This is necessarily based on previous research work, and the latter cannot be neglected without serious injury to the commercial side. Theory and experiment precede the processes required by Progress, and supported by Capital. Few realize how important a factor electricity has become in our industrial welfare based on mineral resources. The Geological Survey's report on the Mineral Resources of the United States is subdivided in six parts devoted respectively to metals, fuels, structural, abrasive and chemical materials, and miscellaneous. Of these natural resources fuel has heretofore been the most necessary in converting the others to the use of man, but so prodigal has been its use that the supply is being rapidly exhausted. Already this deficiency in power and heat has been partly filled by hydraulically generated electricity, which may yet solve the fuel problem.

Of the metals there is not one for which an electric smelting or refining process has not been devised. Aluminum is produced solely by its action, its lower cost having put the old crucible method out of competition, and caused the price to drop from fifteen dollars to thirty-five cents per pound. Nearly three-fourths of the copper produced in this country is refined electrolytically, and such is found to have a higher conductivity, but lower tensile strength. Incidentally, this furnishes nearly 6 per cent of the total gold and more than 25 per cent of the total silver production. The large amount of these metals used in coinage is also refined electrolytically. The Betts electrolytic process of lead reduction has been installed in two of the latest and most modern refineries —The United States Metal Refining Co., and the Canadian Metals Co. The latter is also producing antimony. In separating zinc from associated iron sulphide, electrostatic and electro-magnetic concentrating machines are used, and a smaller plant for the electro-thermal smelting of zinc ores has been erected at Nelson, B. C.

Electric smelting of iron ore has not yet proven commercially successful on a large scale in competition with the blast furnace in America, through Norway's special ores are being treated by this process. Where electricity can be developed at a cost of $10.00 per electrical horsepower year, Harbord has estimated that it is on a par with coke at $7.00 per ton. It would be practical for ore carrying titanium or other substances that are hard to treat in the blast furnace, and is being successfully applied to the manufacture of high grade steels and ferro-alloys, such as manganese, chromium, tungsten, nickel, vanadium, molybdenum and titanium. Experiments are being made in California for treating ores of mercury, and tin is also being refined in this way.

Electro-chemistry has little application in treating the so-called structural materials, though many of these are largely used for electrical purposes. Artificial abrasives, including carborundum and alundum, produced in the electric furnace, make up one-third of the total used. Of the miscellaneous materials, the manufacture of phosphorus from phosphori rock in an electric furnace, and the production of artificial graphite, are the most notable, although the electromagnetic concentration of monazite and zircon promise some success. Various gems, including the diamond, sapphire and ruby, have been made in an electric furnace, but with the exception of the latter, have not replaced Nature's product.

In Europe the atmospheric fixation of nitrogen is being applied to calcium cyanamide and nitric acid, and in this country calcium carbide, made in the electric furnace, is now universally used.

We have briefly indicated the extensive uses of electricity in the industrial scale, but when we consider that every process mentioned has been practically developed in the last two decades, we may well be sanguine of electricity's conquest over heretofore refractory ores, when its great power is guided by the experience already gained. But our enthusiasm for its possibilities must not override prudent recognition of its limitations. For while it can apparently accomplish all things there are yet other powers that can do some of these things much cheaper. These are often available where electricity is not, and will occupy the greater part of the field until electricity can be produced for a small fraction of its present price.

TRADE NOTICE.

The Westinghouse Electric & Mfg. Co. have moved to permanent quarters at 165 Second St., San Francisco, and invite their friends to inspect the same. This new and commodious location gives every facility for the rapid handling of orders, insuring satisfaction to buyers.

TRADE CATALOGUES.

Bulletin No. 33, from the Warren Electric Mfg. Co., of Sandusky, Ohio, gives an account of electric welding in machines made by them. It contains much interesting and valuable information on rapid butt welding.

N. E. L. A. CONVENTION, 1908.

Thursday, May 21st, has been set aside by President Farrand as Commercial Day for the National Electric Light Association's Convention. The committee, composed of C. W. Lee, J. Robert Crouse, John F. Gilchrist, George Williams, Howard K. Mohr and Frank B. Rae, Jr., has been busily engaged in preparing the program for the day. It is the purpose of the committee to have the papers which will be presented consume the least possible time; the major portion of the two sessions being devoted to discussion. The following is the program as outlined by the committee:

Commercial Day Program.

(1)—Special Feature: Relationship between the Engineering and Commercial Departments by a prominent electrical engineer.

(2)—Preparation for a Campaign: (a) Field Work and Other Essentials; (b) Analysis of Customers' Accounts; (c) Proportion of Lamp Equivalents Lost to Lamps Connected, showing percentage in cities of varied population; (d) Policy of Handling Complaints; (e) Policy of Handling Collections.

(3)—The Contract Agent and the Representative: (a) The Contract Agent—His Possibilities; (b) The District Representative—His Possibilities; (c) The Special Representative—1. The Sign Expert; 2. The Power Expert; 3. The Woman Representative. (d) Solicitors' Meetings—Their Objects.

(4)—The Display Room: (a) Appointments and Methods; (b) Value of Special Demonstrations; (c) Value of Electrical and Food Show Exhibits.

(5)—Advertising: (a) What is Being Done; (b) Why; (c) Results.

(6)—Publicity: (a) Methods to Create Proper Public Sentiment; (b) Dormant Publicity Opportunities of Lighting Companies.

(7)—Creating Demands for Electricity: (a) The Creative Principle; (b) The Notable Examples; (c) Stereopticon Talk Upon Outline and Sign Lighting—showing progress in large and small cities.

(8)—Evolution of New Business Building: (a) Examples of Central Stations that have continued methods during depression; (b) Strong Plea for Up-keep of Commercial Departments and Advertising; (c) Opportunities for Creating business along existing lines.

(9)—The Electrical Contractor—Symposium: (a) What He is Doing to Assist in Creating Greater Demands for Electricity; (b) Specific Examples.

(10)—Co-operative Commercialism, by J. Robert Crouse.

(11)—Illuminating Engineering as a Commercial Factor (illustrated), by V. R. Lansingh.

(12)—Report of Committee on Solicitors' Hand-Book. Award of prizes offered by Co-operative Electrical Development Association.

PERSONAL.

Bertram M. Downs, secretary of the Brookfield Glass Company of 218 Broadway, New York City, is in San Francisco.

Mr. C. E. Winchell, Los Angeles manager for H. W. Johns-Manville Co., has been in San Francisco during the past week.

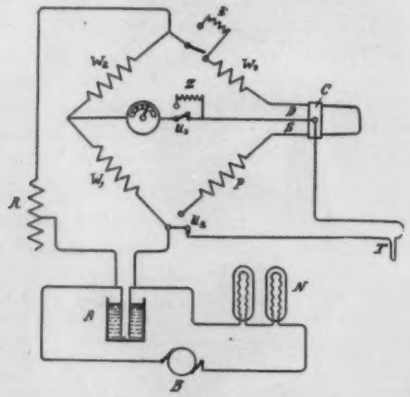
Mr. J. E. McGillivery, Western representative of the American Electric Telephone Company, of Chicago, is in San Francisco, to establish a local office. This firm has just put in a 3,000-line, central-energy board at Topeka, Kansas.

Mr. J. R. Allen, leading contractor of San Diego, California, was at the St. Francis last week. Mr. Allen was formerly in business in San Francisco. This is his first visit since the fire, and he was loud in his praise of the enterprise shown in the rapid rebuilding and high class of structures.

PATENTS

ELECTRICAL SYSTEM OF MEASURING TEMPERATURES. 880,074. Ernest Haagn, Hanau, Germany, assignor to firm of W. C. Heraeus, Hanau, Germany.

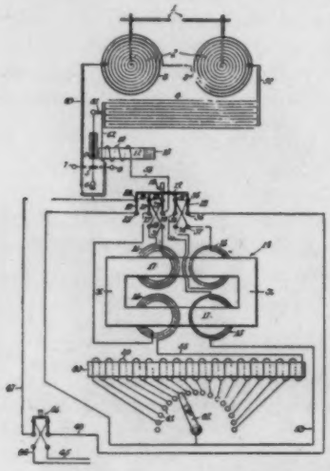
In a system of electrically measuring temperatures, the combination with a Wheatstone bridge, of a resistance thermometer included in one of the branches of said bridge



a galvanometer included in the central branch of the bridge and having a scale indicating the variations of the temperature of said resistance thermometer, an iron resistance connected in series with the bridge, and a polarization cell connected in shunt with the bridge.

HIGH-FREQUENCY DISCHARGE APPARATUS. 880,046. James E. Seeley, Los Angeles, Cal., assignor to Synchronous Static Company, Los Angeles, Cal.

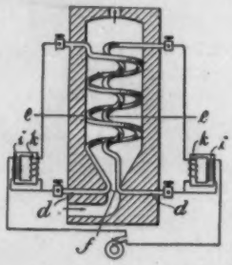
A high-frequency discharge apparatus comprising a discharge circuit, a charging circuit, a supply circuit, an induction apparatus having a plurality of windings, means for connecting one of said windings in the supply circuit



and the other of said windings in the charging circuit, said induction device having a closed circuit core, and switch means for connecting the coils on said core to energize the core on closed magnetic circuit or in open magnetic circuits in opposite directions.

METHOD OF TREATING GASES AND GAS MIXTURES BY MEANS OF VOLTAIC ARCS. 880,037. Albert J. Petersson, Alby, Sweden.

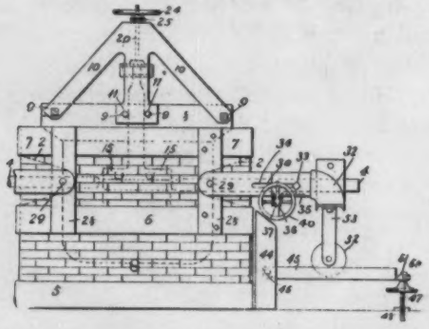
The method of treating gases by means of voltaic arcs which consists in leading gases through a furnace chamber, creating the said arcs between electrodes in the said furnace chamber and creating electrodynamic forces by means of



electric currents of greater intensity than that of the current creating the arcs and induced by the last-mentioned current for displacing the arcs.

ELECTRIC-ARC FURNACE. 880,338. Sidney D. Spence, Chattanooga, Tenn.

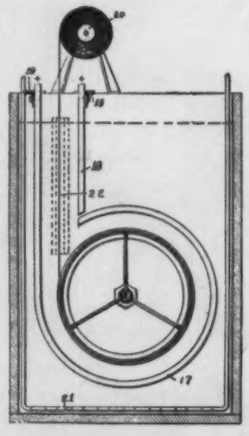
An electric arc furnace having a removable cover, longitudinally disposed tie and reinforcing rods extending through said cover, upwardly extending brackets at the



ends of the cover and to which the ends of the said rods are attached, a fixed supporting element connecting the said brackets and disposed above the cover, a movable bar, means connecting said supporting element and said supporting bar, and screws to adjust the latter, and electrodes carried by and adjustable with said supporting bar.

PROCESS OF PRODUCING VERY THIN SHEET METAL. 880,484. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to Edison Storage Battery Company, West Orange, N. J.

An improved process for producing metallic sheets or foils, which consists in electrolytically depositing a thin



metal film on a polished surface of an aluminum-copper alloy in which the percentage of copper largely predominates, and in finally stripping the film from said cathode below the surface of the bath.

INDUSTRIAL

KOERTING OIL FIRING.

The Koerting patent oil firing system eliminates the necessity of steam or air for atomizing purposes. The oil is super-heated and at the same time the pressure is kept high enough to prevent gasifying or carbonization. When it is forced through the centrifugal spray nozzle the oil flashes into the finest atoms and mixes with the air in the combustion chamber.

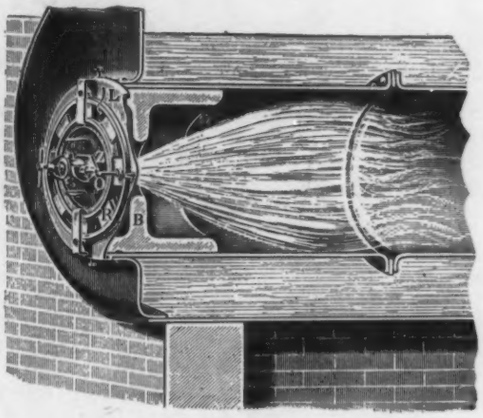


FIG. 1.

It flows from the supply tank to a central pumping outfit in which it is heated, filtered and pumped to a second heater, where it is raised to 220 or 290 degrees Fahrenheit, considerably above its flash point at atmospheric pressure. From the second heater it is forced through the spray nozzle into the combustion chamber. The steam used for pumping and heating is condensed and returned to the boiler feed.

Fig. 1 shows the centrifugal spray nozzle, the air admission registers and the method of spraying. If there is steam in the boiler it is carried to the heaters and the pump started to circulate the oil through the circular pipe until it is hot enough. Meanwhile all gases in the fire-room are drawn out by putting on full draft, thus preventing danger of explosion. The oil is ignited from the spray nozzle after the ring-pipe has been shut off.

If there is no steam pressure on the boiler, then the warming up arrangement should be started. When starting the oil firing plant, smoke will appear until the walls of the fire-room are heated to a temperature that the flame is not cooled off. When stopping the plant, the air admission must be shut off so that the boilers do not cool too much.

The spray nozzles are constructed for easy access and thorough protection against clogging. The casing (or nest) installed in front of the boilers, holds one, two or four nozzles, according to the evaporation required. Each nozzle is protected by a strainer and each spiral may be removed and exchanged without disconnecting the nest from the boiler plate, avoiding interruptions from obstructions. A cock is installed on each nozzle, and one thermometer and pressure gauge placed on each boiler in the oil line. The pipe line to the nozzles is arranged circular for the purpose of heating the liquid fuel to the correct temperature by pumping the oil over and over, nozzles being shut off.

Either circular slide registers or cylindrical air admission slides are used to caary the air to the furnace- The last construction has the advantage of protecting the fireman from the radiant heat; but it takes a little more room than the circular register. The registers properly regulate the amount of combustion air, while the brick lining of the boilers serves the purpose to bring the air in the correct way to the oil and prevent the flame from coming in direct contact with the walls of the boiler, as this reduces the heat of the flames so much that the carbon does not burn.

Fig. 2 illustrates oil firing on marine boilers and Fig. 3 on locomotives. In the case of marine type boilers, the full section of the furnace is used, the grate being unnecessary. Therefore there is a gain in heating surface. The heating and resulting expansion is equal, and all the water surrounding the flue is correspondingly heated. The short fireclay lining in the furnace serves as a protection against the intense temperature of the oil flame, and enables the boiler to be readily set to work after a short interruption, as no after-heating is necessary; the oil ignites on the incandescent fireclay.

One pound of fuel oil does the same work, in evaporating the water in the boilers, as 1.4 pounds of coal, or 4.2 barrels of fuel oil are equal to one ton of coal. One man only is necessary in the boiler-room. The conveying of fuel to the boiler is accomplished by the system. The larger the plant the greater the saving. Sixteen hundred pounds of fuel oil is equivalent in heating value to one ton, or 2240 pounds of coal.

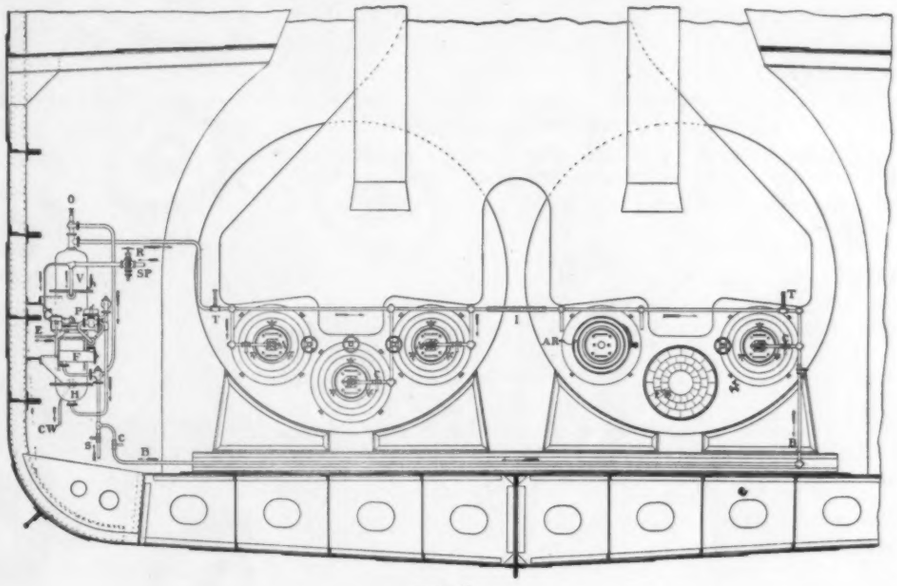


FIG. 2.

The application of the centrifugal sprayer obviates the defects of the steam-jet system, and secures several important advantages. In spraying petroleum, raw naphtha, mazut, astatki, etc., by means of steam jets, a certain portion of the heating value of the fuel is lost, as the steam has to be raised to the furnace temperature, and, being used for spraying, is lost to the boiler. In the case of marine boilers

this loss is especially disadvantageous, as the steam used for spraying represents a loss of water which has to be replaced. This loss is often 100 per cent or even more than the weight of oil sprayers.

Compressed air systems are expensive to run on account of power required and the amount of wear and tear

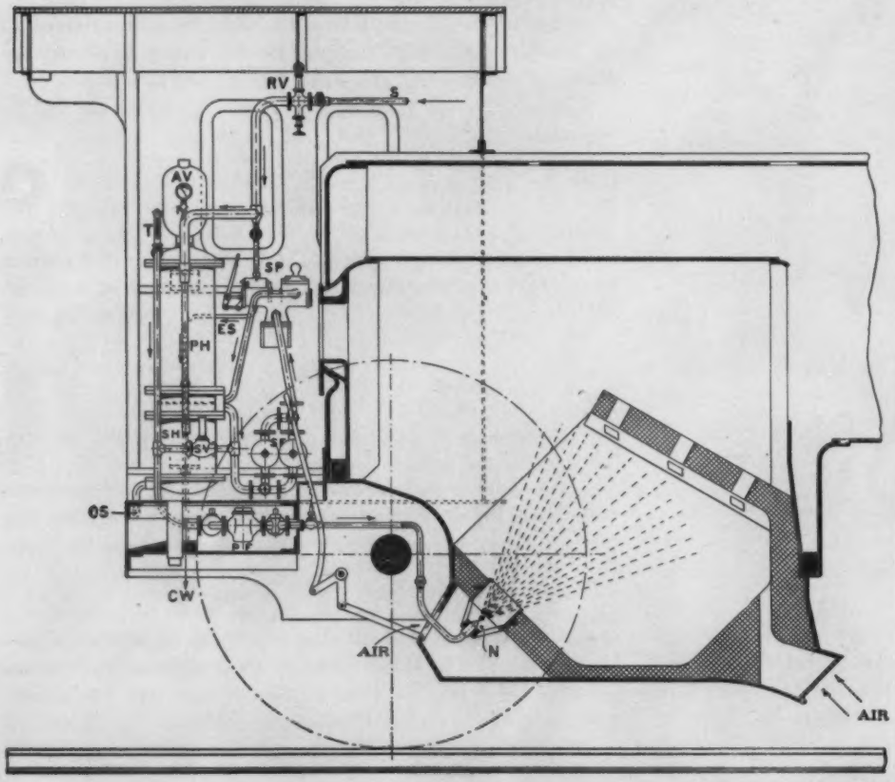


FIG. 3.

resulting from the intense flames. The power required to run a Koerting system can be easily estimated as follows: To move 100 pounds of oil under a pressure of seventy-five pounds, requires only 0.8 pounds of steam. The steam required for two heaters is approximately eight pounds steam per 100 pounds of oil. Figuring one pound of oil to evaporate 13 pounds of steam would mean 100 pounds of oil creates 13000 pounds steam. On this system according to above, ten pounds steam would equal $\frac{7}{10}$ per cent of steam developed. Steam-jet burners, or burners working by compressed air, use about fifteen to twenty-five per cent of the steam developed for spraying the oil.

The centrifugal sprayers give effective atomizing, therefore high efficiency; smokeless combustion, reliability in working, no noise, no waste—all water returns to the boiler; equable heating of upper and lower parts of furnace in marine, Lancashire or Cornish boilers; simplicity of air regulation, ease in replacing the burner by a spare nozzle, no intense local flames, increase of heating surface, minimum attendance required, easy and slow firing at start.

The Benjamin Electric Manufacturing Co., of Chicago, have received notice from the National Board of Underwriters that their new No. 903 Attachment Plug has been approved. On account of a number of unique features which this device embodies, it has met with unusual favor with the trade. The manufacturers have been compelled to take special measures in order to meet the rapidly growing demand. The fact that it is now National Code Standard removes the last obstacle in the way of its final acceptance. Descriptive circular matter will be sent on application. The company has an office at 656 Howard Street, San Francisco.

A NEW HOLOPHANE STREET LIGHTING REFLECTOR.

The Holophane Company announces a new street lighting reflector for incandescent lamps which is without doubt one of the most remarkable developments of the Holophane System yet offered.

This reflector is designed with a series of exterior vertical reflecting prisms on the side which faces the sidewalk and an interior set of carefully calculated diffusing prisms on the side facing the street. This combination gives an irregular distribution of light in the horizontal plane.

When the reflector is properly placed at about the curb line, it throws the light with great intensity up and down the street and more moderately across the street, and when "staggered" at proper distances along the curb, gives practically uniform distribution of light on both roadway and sidewalk.

The vertical distribution is equally satisfactory, a unit consisting of this reflector with 40-candlepower Gem lamp, giving about 20 candles directly beneath the light while the intensity at 10 degrees below horizontal is over 80 candlepower.

Other practical advantages are: It is not easily broken, and so serves to protect the lamp. It gives practically double the useful illumination of the bare lamps. It is not materially affected by dust, all prisms being vertical. With modern high-efficiency lamps it enables the electric lighting company to compete with small gas lamps on practically equal price basis. It can be intalled inside opal, frosted or other globes where decorative effects are desired.

"DOSSERT" CONNECTORS RECENTLY ORDERED FOR NEW YORK CITY.

Dossert & Company, of New York City, have received what is probably the largest order for terminal lugs ever used on a single installation in this country. The material is for use in the wiring of the immense terminal buildings at Cortlandt, Church and Fulton Streets, New York, of the Hudson & Manhattan Railway Company, operating the tunnels under the Hudson River, which have just been opened to the public. These terminals are all of the Dossert solderless type, comprising front connection, back connection, angle swivel lugs, and range in size from 2,000,000 C. M., to No. 4 cable. Part of the order comes from the Westinghouse Electric & Manufacturing Company, of Pittsburg, Pa., and is for lugs to be used on their fuse blocks, enclosed type, 61 to 600 amperes. Approximately 1,000 Dossert solderless lugs are required for the switchboards and panelboards of these great twin buildings. F. A. Lawson & Co., Pacific Coast agents, 209 Monadnock Building, San Francisco, Cal.

NEWS NOTES

WATERWORKS.

San Bernardino, Cal.—Foreman Rickman, who is in charge of the erection of the water treating plants, has gone to Keenbrook to start work on a smaller one than is installed in this city.

San Francisco, Cal.—Water rates for the year beginning July 1st came before the Board of Supervisors at the last meeting in two committee reports—Johnston and Murphy advocating the re-enactment of the 1903 rates, with the exception that the city should increase its own allowance to the Spring Valley Water Company to $150,000. Mr. McAllister submitted a minority report, in which he advocated giving a fifteen per cent increase to the company over the 1902 rates. Both reports based their charges upon the theory that the company was entitled to a five per cent net income on the value of the plant actually in use.

Oakland, Cal.—The city of Oakland will receive bids on March 18th for the pumping machinery to be used in the construction of its auxiliary high-pressure pumping and salt water distributing system as a further protection against fire. The plant will consist of two gas engines geared to two centrifugal pumps, together with an auxiliary gas engine, pump and motor, air compressor and storage tanks, accumulator and other appurtenances. The plant is to be located on the west shore of Lake Merritt. The combined capacity it to be 2,000 gallons of salt water per minute, raised against a head of 200 pounds pressure at the discharge and of the pump, the maximum suction lift being seven feet above the floor. Each engine is expected to develop 250 horsepower and the pumps must have an individual capacity of 1000 gallons per minute. An auxiliary pumping plant will be furnished and used for maintaining a pressure of fifty pounds in the force main and distributing system while the main pumps are not in operation. It will have a capacity of fifteen gallons per minute. It is required that one pump shall deliver its full capacity of water at the specified head within two minutes after starting, and that both pumps shall be delivering their full combined capacity within five minutes of the beginning of the test.

TRANSPORTATION.

San Francisco, Cal.—The Geary road suit in relation to the $720,000 sought to be set aside for a municipal railway in the budget of last June has been dropped. This leaves $395,000 in the city treasury without a purpose.

San Diego, Cal.—The Board of Public Works has issued an order compelling the San Diego Electric, the Los Angeles & San Diego Beach Electric and the South Park & East Side Electric Railroad Companies to fill in between their tracks on both paved and graded streets.

Chico, Cal.—Twenty-five acres have been transferred to the Northern Electric Company by the Valley Syndicate for the future establishment by the Northern Electric Company of freight yards immediately south of the Chico car shops. Between six and eight miles of parallel sidetracks will eventually be constructed, after the company's finances are such that the proposed extensions can be constructed.

Long Beach, Cal.—F. A. Crowe has sold the franchise which he recently purchased from the city to George H. Bixby, who is said to be acting for the Pacific Electric Company. They are important franchises, one being for a line the entire length of Seventh Street within the city limits, the other giving rights to build and operate a road along Pine Avenue, between Sixth and Fourteenth Streets.

Oakland, Cal.—Representatives of the Oakland Carmen's Union, and the Oakland Traction Company and the Key Route system, have signed an agreement to govern the wage scale of the carmen for twelve months, commencing March 1st. The carmen decided that the old scale was satisfactory and the executive committee was authorized to sign a new agreement on the same terms as the old one. The wage scale, which it is agreed shall continue, and which bears the distinction of being the highest wage scale for street car employes in the United States, provides for the payment of forty cents per hour to motormen and conductors of the Oakland Traction lines and to the collectors of the Key Route lines. The motormen and conductors of the Key Route are paid from thirty-eight to forty-two cents per hour.

OIL.

Carson, Nev.—Treasurer Brown, of Mono County, Cal., who is now in this city, announces that a Los Angeles bank has agreed to finance a pipe line from Mono Lake to Goldfield to carry oil from the new fields there to the southern mining camp. An expenditure of $750,000 is necessary to carry the scheme to completion.

Santa Barbara, Cal.—The Palmer Oil Company has closed a contract for 2,000,000 barrels of oil to be delivered in the next three years at fifty cents a barrel at the well. The Palmer Oil Company has completed arrangements for the construction of an eight-inch pipe line from its wells to the pipe lines now in the Santa Maria field.

Rhyolite, Nev.—The Nevada-Utah Oil & Pipe Line Company has been organized to develop four sections of oil land in Washington County, the officers being O. D. Van Buskirk, president and general manager; Clay Tallman, attorney; Geo. B. Keenan, secretary; Geo. B. Davis, cashier. The main office is at Oakland. In addition to drilling for oil, the company will establish a pipe line to some point convenient to transportation.

FINANCIAL.

San Francisco, Cal.—Assessment No. 7 of 2 cents per share, delinquent March 24th, sale day April 14th, has been levied on the Williams Oil Company.

Pasadena, Cal.—Acting on the advice of Attorneys Dillon & Hubbard, Mayor Early and the Council will resubmit the issue of $1,000,000 in bonds for the purchase of three water companies.

Tucson, Ariz.—The $300,000 Tucson bond bill has passed the House of Representatives and the Senate and has been signed by President Roosevelt. The amount set aside for the improvement of water mains will be $26,000; for fire department, $25,000, and for city hall, $15,000.

Santa Barbara, Cal.—A resolution has been adopted by the Mayor and City Council for issuing bonds in the amount of $36,000 for continuing the construction of municipal improvements. The work will include the building of a storage reservoir and impounding dam.

Redding, Cal.—The suit of the Battle Creek Power Company against the Pacific Power Company and others to condemn twelve acres of land on Battle Creek for a reservoir site ended last week, after three weeks in court, the jury giving the Battle Creek Company the land sought, but requiring $32,500 as damages. The land is worthless except for the water rights going with it. The Battle Creek Company's right to 18,000 inches of water was confirmed.

San Francisco, Cal.—President Patrick Calroun, of the United Railroads Co., has issued for the information of the bond and stockholders of the street railroad corporation a report showing the gross earnings of the company for December last. They amount to $481,285, as compared with $562,200 for the same month of the preceding year, or a decrease of $80,915. This is the fifth monthly report of gross receipts made by Pres. Calhoun since the carmen's strike, which began on Sunday, May 5th, 1907, and continued until late in that year. These reports contain no mention of operating and other expenditures. The five monthly statements of gross receipts are as follows: June, 1907, $152,126; 1906, $448,455; decrease, $296,329; August, 1907, $317,769; 1906, $429,311; decrease, $11,542; September, 1907, $367,220; 1906, $425,199; decrease, $57,979; November, 1907, $449,732; 1906, $536,166; decrease, $96,428; December, 1907, $481,285; 1906, $562,200; decrease, $80,915.

INCORPORATIONS.

San Francisco, Cal.—The Fledge-Mohr Electric Appliance Company has been incorporated with a capital stock of $100,000 by L. P. Degan, A. C. Fiege and Otto H. Mohr.

San Francisco, Cal.—The Result Oil Company has been incorporated with a capital stock of $25,000 by P. E. Bowles, F. W. McNear, O. D. Jacobs, E. J. Broberg and A. A. Griffin.

Santa Rosa, Cal.—Articles of incorporation have been filed by the Chileno Valley Telephone Company, with a capital stock of $5,000. The directors are M. De Martin, Chas. Martin, A. Bloom, H. Juhl and J. Schobeda.

Santa Ana, Cal.—Articles of incorporation of the Juergo Land & Water Company have been filed. The capital stock is $10,000 and headquarters are at Los Patos station on the Pacific Electric line. The directors are Owen McAleer, R. C. P. Smith, Lester L. Robinson, W. J. Cullon and Byron Oliver.

San Frfancisco, Cal.—The Clear Lake Power & Irrigation Company has been incorporated with a capital stock of $10,000,000. The company has been formed to bring electric power to San Francisco for all purposes and to irrigate 200,000 acres of land in Yolo County. The names of the capitalists behind the project are kept secret by the counsel, Charles S. Wheeler.

Oakland, Cal.—The consolidation of the San Francisco, Oakland & San Jose Railway, known as the Key Route, and the San Francisco & Bay Counties Railway, of which articles of incorporation were recently filed, has been effected. The purpose of the consolidation, as outlined in the articles reincorporating the two companies under the name of San Francisco, Oakland & San Jose Consolidated Railway, is to operate a railway along the eastern side of San Francisco Bay to San Jose in conjunction with the present Key Route service, and construct a sub-way to Goat Island. The latter project is to be carried out as "soon as same can be done under the State laws." It will begin at the pier head line and bring up at some point on the island. A railway service will be maintained in the tunnel, which will also accommodate a telephone and telegraph line. The capital stock of the new consolidation is given as $7,750,000, all of which has been subscribed. The directors are: F. M. Smith, F. C. Havens, A. E. Heron, H. Wadsworth and Dennis Searles, all of Oakland.

TELEPHONES.

Independence, Ore.—Geo. E. Waggoner, of the Home Telephone Co., was up from Portland Friday trying to get an organization started for the installing of an independent telephone system here to connect with the Home Company.

North Yakima, Wash.—Messrs. Fullerton, of San Francisco, and Fleager, of Seattle, construction superintendents of the telephone system of the Pacific Coast States, were in North Yakima recently and walked over the entire system in this locality. As a result of their visit it is believed that the construction work on the west side, which was expected to be undertaken about June, will be begun at a much earlier date. The work there is to be the erection of what is termed a "backbone" for the service, running direct west through the city and beyond to the limits of building construction, the various service lines to radiate from it.

Billings, Mont.—J. Nevin Perry, manager of the Billings Mutual Telephone Company, returned from Fishtail and Absarokee, where he completed arrangements with the Stillwater Co-operative Telephone Company to connect with the Mutual Telephone Company at the Columbus exchange. The arrangement will extend the service of the Billings Mutual Telephone Company to all the farms and towns in the Stillwater and Rosebud valleys. It will give the residents there connection with the Billings telephone exchange and will give subscribers of the Mutual Company in Billings and the district adjacent thereto connection with the phones on the Stillwater Co-operative Telephone Company's lines.

ILLUMINATION.

Escondido.—A special election will be held to vote upon the proposition of installing an electric light plant.

Ocean Park, Cal.—E. A. Wilson & Co., of Santa Monica, have been awarded the contract for furnishing new lamp posts for Ocean Front Walk, for $2,475. Wiring will be done by the same company for $2,878.

San Diego, Cal.—A tax will be levied on the property owners on Sixth Street for the erection of ornamental lighting posts. The erection will cost $5,490. When the money has been collected the Board of Works will advertise for contracts.

Washington.—Contracts have been awarded for two fifty-horse-power gas engines and apparatus to make gas from crude oil at a total cost of $8,000 for the Yuma irrigation project. The plant is to be in operation in ninety days and it is expected that 10,000 acres near Yuma will be irrigated by pumps during 1908.

Compton, Cal.—Representatives of the Edison Company of Los Angeles have been here with a proposition to install a gas plant. Their proposition is build a plant between this place and Watts, and furnish the two places with gas at the rate of $1.50 per 1000. They ask Compton to guarantee $3,000 in stock when the plant is erected and started operating.

Benson, Ariz.—President John Mets wrote the manager of the Luzoline Gas Company that the company would lay pipe not later than the 15th of next month. At the present time the company is manufacturing the fluid from which the gas is made in Tucson and Los Angeles, but if the company can get the business in Benson they will erect a plant here.

Los Angeles, Cal.—Ground has been broken for the plant of the Huntington Park Gas & Electric Company, and as soon as excavations are completed the building will begin. The company has two acres of land in the northwest corner of block 1 at Slauson Avenue and Middleton Street. The machinery for the plant has been purchased and contracts let for the work. The incorporators are F. M. De La Matyr, J. J. Curren and E. T. Kepkfeld.

Sacramento, Cal.—The Sacramento Natural Gas Company is sparring for time in the matter of paying to the city the three per cent tax on its gross receipts as provided in its franchise, in paying which it has been delinquent for the past five years. The matter was called to the attention of the Trustees and City Collector Spaulding several weeks ago. Mr. Spaulding immediately notified the company, but H. C. Keyes, the former manager, is in Europe, and his son, Homer F. Keyes, who was acting as manager in his absence, asked for time in order to send a cablegram to his father. A message was sent to Mr. Keyes, but up to the present time no answer has been received. The amount due the city from the company will probably be somewhere between $4,000 and $6,000.

LIGHT AND POWER.

Helena, Mont.—The highest dam anywhere in the Western country will be erected across the Missouri River a few miles from Wolf Creek on the site of the power plant of the Capitol City Power Company. M. H. Gerry, Jr., is general manager. The dam will be 117 feet high, built of concrete and steel, and will back the water up a distance of eighteen miles. The plant will generate 30,000 horse-power.

Malad, Idaho.—Articles of incorporation of the Malad Power Company have just been filed with the Secretary of State. The company is capitalized at $1,000,000. Its purpose is to put in a power plant to utilize 800 second feet of water which it takes over from the King Hill Irrigation & Power Company to irrigate a large amount of Carey act lands soon to be opened up in that section.

Tillamook, Ore.—The dynamos of the Tillamook electric light plant will have a capacity of 2000 lights, about twice what they expect to sell. Boiler and engine will be new and of the latest designs. The plant will be temporarily located on the slough between Long's mill and the Pacific Navigation Company's freight sheds. They expect to spend in the neighborhood of $15,000 at the start.

Tacoma, Wash.—Donald Fletcher, a Tacoma real estate man, appeared before the Commissioners of King County in an effort to obtain a franchise along the King County public road leading to Green River Hot Springs for electric feed wires transmitting nearly 100,000 horse-power to be generated by a mammoth water power electrical plant which Fletcher and Eastern capitalists propose to build on the Cle Elum River about seven miles above the head of Lake Cle Elum. Fletcher has already made application for franchises for a line in Pierce County extending through Buckley, Sumner, Orting and Puyallup.

Portland, Ore.—The Portland Railway Light & Power Company has put into use for the first time, one section of the new gas plant, on which it has been quietly at work for nearly three months past. The company has installed an almost complete new plant consisting of a recuperative bench of six retorts, capable of generating 100,000 cubic feet of gas every twenty-four hours, and other expensive modern machinery. The new plant has about three times the capacity of the old plant, the combined capacity of the entire plant being now about 150,000 cubic feet. The cost of the work when completed at the gas plant alone will amount to about $20,000.

ELECTRICAL INCORPORATIONS.

Seattle, Wash.—The Electric-Thermo Alarm Company, $250,000; Watson James Hill, Frederick E. Kreatz.

Tillamook, Ore.—The Tillamook Electric Light & Fuel Company, principal office; capital stock, $15,000; Charles I. Clough, A. K. Case and Henry Crenshaw.

Benton, Wash.—The Benton Independent Telephone Company, Prosser; $4800; Clark E. DeBow, James M. Hobland, Frank P. Jackson, Rufus H. Bone, John T. Brownfield, Thomas J. Stockdale, George C. Lincoln and Ira Carter.

TRANSMISSION.

Alamogordo, N. M.—Merrill H. Fisher is preparing to build an electric power house. It will be 120x35 feet and will cost, exclusive of boilers, engines, dynamos and equipment, $5,000.

Gridley, Cal.—A. C. Musselman and D. A. Matheson of Chico have bonded the Richardson Springs property, owned by J. H. Richardson. The installation of a small power plant, to be operated with water from the second falls, is proposed.

San Francisco, Cal.—At the last meeting of insurance men in regard to the Pacific Light & Power Company's plant at Redondo, no definite conclusion was reached, as the fire was not reported until considerable repair work had been done. An adjuster has been sent to investigate as to the exact extent of the loss, and determine how much of it was due to the explosion.

Ogden, Utah.—Plans for the erection of a power plant at Devil's Gate, in Weber Canyon, have been completed and officials of the Utah Light & Railway Company announce that work will be begun in the early spring. The plant will cost $350,000 and will be built by the Utah Light & Railroad Company, which is a part of the Harriman system. Power lines will be run from the plant to Ogden and on to Salt Lake.

San Francisco, Cal.—The Bay Counties Power Company has a gang of linemen at work on the main line in Solano County installing what are termed safety nets at all points where the electric wires pass over the Southern Pacific tracks. These nets are composed of a number of wires strung on separate poles below the live wires and arranged for the purpose of catching the main current wires in case of a break, and thus preventing any serious damage being done to trains or to telegraph lines.

TELEPHONE AND TELEGRAPH.

Winnemucca, Nev.—The Utah-Nevada-Idaho Telephone & Telegraph Company has closed a deal for the purchase of the Home Telephone Company having lines in Winnemucca and to Goldbanks, Paradise and Golconda. By this purchase the Utah-Nevada-Idaho Company has secured a telephone service from Salt Lake into all of the important towns of Eastern and Southern Nevada, from Salt Lake to Ely, from Ely to Tonopah, and from Tonopah to Fairview, Wonder and Rawhide. They will now connect the Fairview line with Winnemucca. The company will begin construction of a number of lines which will eventually connect Winnemucca with San Francisco.

Los Angeles, Cal.—Application has been made to the Council by oil men for a permit to lay about ten miles of pipe along Western Avenue from the north city limits southerly to Vernon Avenue, easterly to the river, and by an almost direct line to the city limits. The purpose of the pipe is to supply tanks miles from the oil fields and to have a quicker way of getting oil to the factories.

Rhyolite, Nev.—J. F. Phelan reports that the Virgin River Oil & Development Company, controlled by Rhyolite parties, has struck a good flow of oil eight feet from the surface.

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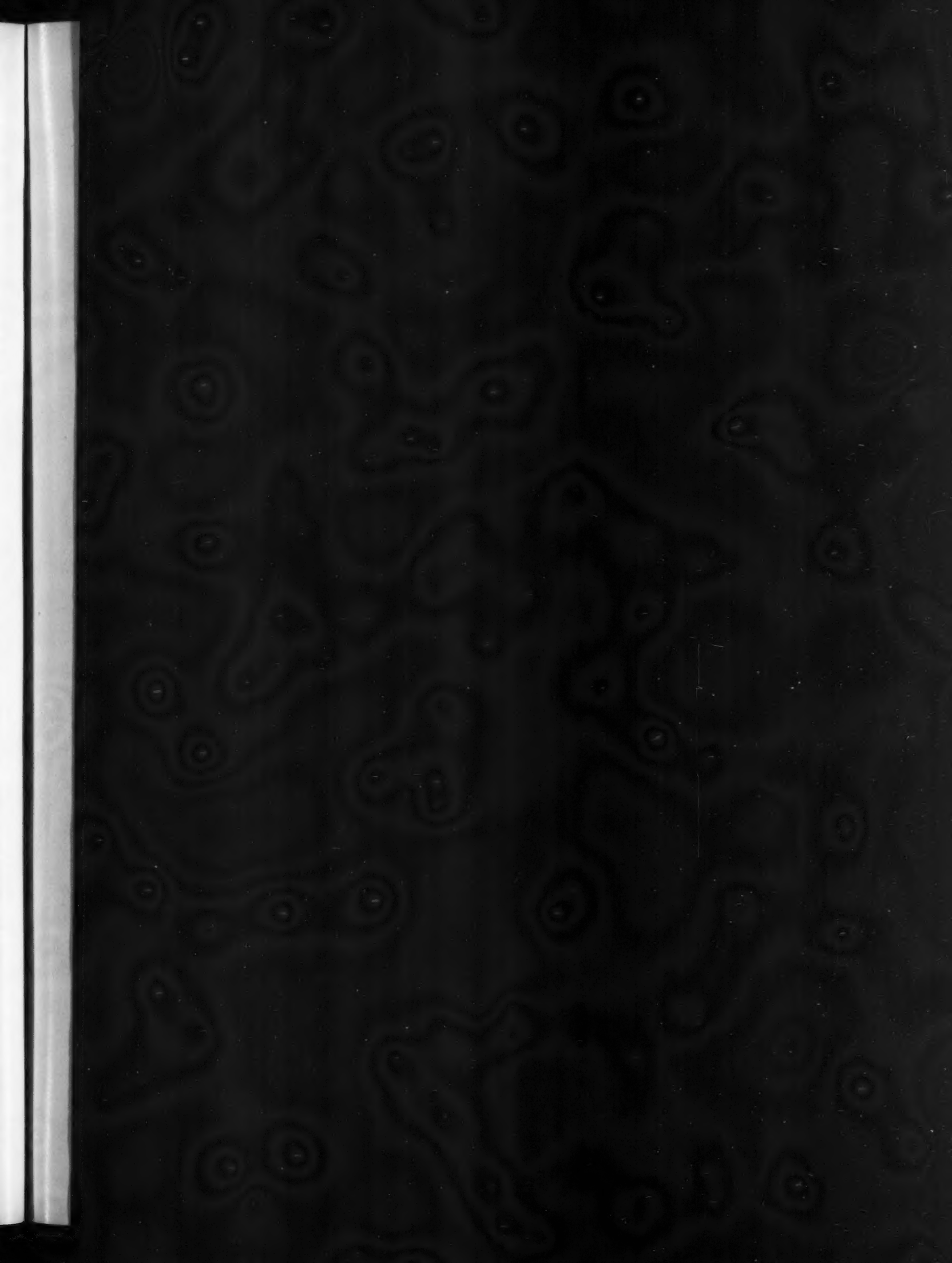
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